IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re:	Patent Application of Hideo YOKOTA	: Group Art Unit: Not Yet Assigned
Conf No.:	Not Yet Assigned	:
Appln. No.:	Not Yet Assigned	: Examiner:
Filed:	Herewith	:
For:	CUTTING OR GRINDING OIL COMPOSITION	: Attorney Docket : No. 8305-210US : **(NP102-1)**

PRELIMINARY AMENDMENT

Simultaneously with the filing of the above-identified application with which this Preliminary Amendment is being filed, and prior to the calculation of the filing fee, Applicant hereby amends the application as follows, without prejudice:

In the Specification:

Please amend the specification as follows (a marked-up copy of pages 1, 4, 5 and 52 are enclosed to show the changes made):

At page one delete "Description" and replace new Title of the Invention as follows:

-- TITLE OF THE INVENTION

Cutting or Grinding Oil Composition --;

At page 1, before line 3 add new Cross-Reference Section as follows:

-- CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation of International Application No. PCT/JP00/06978, filed October 6, 2000. --

At page 4, before line 18 insert:

-- SUMMARY OF THE INVENTION --;

At page 5, line 1 delete [Disclosure of the invention];

At page 5, before the third paragraph, insert:

-- DETAILED DESCRIPTION OF THE INVENTION --;

At page 52, line 1, delete "Abstract" and substitute therefore the heading:

-- ABSTRACT OF THE DISCLOSURE --.

In the Claims:

Please amend the claims as follows (a marked up copy of claim 12 is enclosed to show the change):

In claim 12, line 1 delete "or 9".

REMARKS

Claims 1 to 16 are pending in the application.

The purpose of this amendment is to insert the reference to the parent application of which this is a continuation, to place the claims in appropriate U.S. form and delete the multiple dependent claims in this application, and thereby eliminate excessive claim fees. Such amendments are formal in nature and no new matter is added by any of the above amendments. Entry of this amendment and early examination of this application are respectfully solicited.

Respectfully submitted,

HIDEO YOKOTA ET AL.

June 25, 2001 By: _____
(Date)

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WWS:jf
Enclosure

MARKED-UP COPY

CROSS-REFERENCE TO RELATED APPLICATION

~~Description~~

TITLE OF THE INVENTION

Cutting or grinding oil composition

This application is a continuation of International Application No. PCT/JP00/06978 filed October 6, 2000.

~~[Field of the Invention]~~

The present invention relates to cutting or grinding oil compositions suitable for use in a minimal quantity lubrication system in which a minimal quantity of the oil is supplied to a spot of a metal piece to be cut or ground, together with a compressed fluid.

[Background of the invention]

Various cutting or grinding oils are generally used in metal working processes for the purpose of lengthening the life of working tools, such as drills, millings, tools, and grinders, improving the roughness of the finished surface of a work, and improving working efficiency thereby, resulting in the increasing the productivity of machining.

Cutting or grinding oils are roughly classified into water-soluble ones which are put in use after diluting the surface-active agent and lubricant component contained therein with water, and water-insoluble ones which contain a mineral oil as a main component and are used as it is, i.e., in the form of a stock solution. In conventional cutting and grinding operations, relatively large amounts of cutting or grinding oil are supplied to a spot of the metal piece to be worked.

The most basic and important functions of cutting oils and grinding oils are lubricating and cooling properties.

not been proposed a cutting or grinding oil having the properties required for cutting or grinding using the minimal quantity lubrication system, more specifically a cutting or grinding oil having high performances which make it possible to provide a worked product with a smooth surface, even though by the use thereof in a minimal quantity, reduce the wear of tools, and perform cutting and grinding efficiently. The development of such a cutting or grinding oil has been demanded. In the minimal quantity lubrication system, the oil is supplied in the form of mist. Therefore, the system involves a problem that the oil easily adheres to the interior of a working machine, a workpiece, the inside of a mist collector and the like. If the adhered oil becomes sticky easily, the treatability thereof is hindered, leading to reduced working efficiency. Therefore, the oils for the minimal quantity lubrication system is desirously hard to be sticky.

BRIEF SUMMARY OF THE INVENTION

In view of the foregoings, the object of the present invention is to provide a cutting or grinding oil composition suitable for use in a minimal quantity lubrication system in which the oil in a minimal quantity is supplied to a cutting or grinding spot of a work, together with a compressed fluid such that the amount of the oil to be disposed as wastes is significantly reduced. Particularly, the object of the present invention is to provide an oil composition which is hard to become sticky and exhibits excellent lubricating properties such that cutting or grinding can be operated efficiently.

DETAILED DESCRIPTION OF THE INVENTION

~~[Disclosure of the invention]~~

As a result of an extensive research, it has been found that the use of a cutting or grinding oil composition containing an ester as a base oil for a minimal quantity lubrication system is effective in workability upon cutting or grinding and in improvement of the finished surface of a work. Furthermore, it has been discovered that the use of an ester having specific characteristics is effective in improvement of the oil in terms of the stickiness to tools which is liable to occur when it is supplied in the form of mist and in terms of lubricating properties. It is also found that an oil further containing oiliness improvers and oxidation inhibitors in addition to the ester present as a base oil, can be improved in lubricating properties and stickiness.

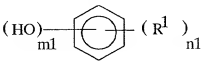
According to the present invention, there is provided a cutting or grinding oil composition containing an ester as a base oil for use in a minimal quantity lubrication system.

The details of the present invention is described hereinbelow.

The present invention provides a cutting or grinding oil composition for a minimal quantity lubrication system. The term "minimal quantity lubrication system" used herein denotes working operations by cutting or grinding which are conducted while supplying an oil in a minimal quantity, such as 1/100,000 to 1/1,000,000 of the quantity of an oil used for a normal cutting or grinding operation, together with

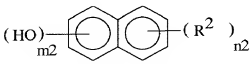
represented by formula (2) given below, (F) polyoxyalkylene compounds, and (G) esters;

said formula (1) being represented by the formula



(1)

wherein R^1 is a hydrocarbon group having 1 to 30 carbon atoms, m1 is an integer from 1 to 6, and n1 is an integer from 0 to 5; and said formula (2) being represented by the formula



(2)

wherein R^2 is a hydrocarbon group having 1 to 30 carbon atoms, m2 is an integer from 1 to 6, and n2 is an integer from 0 to 5.

11. The oil composition according to claim 9 wherein said oiliness improvers are contained in an amount of 0.1 to 50 percent by mass, based on the total mass of the composition.

12. The oil composition according to claim 1 ~~or 9~~ further comprising oxidation inhibitors.

13. The oil composition according to claim 12 wherein said oxidation inhibitor are one or more compounds selected from the group consisting of L-ascoribic acid (vitamin C), fatty acid ester of L-ascoribic acid, tocopherol (vitamin E), 2,6-di-tert-butyl-p-cresol (DBPC), 3,5-di-tert-butyl-4-hydroxyanisole, 2-tert-butyl-4-hydroxyanisole, 3-tert-butyl-4-hydroxyanisole, 1,2-dihydro-6-ethoxy-2,2,4-trimethylquinoline (ethoxyquin), 2-(1,1-

ABSTRACT OF THE DISCLOSURE

~~ABSTRACT~~

Cutting or grinding oil compositions which are suitable for use in a minimal quantity lubrication system in which a minimal quantity of an oil is supplied to the spot to be cut or ground of a work, together with air are reduced in stickiness and improved in lubricity.